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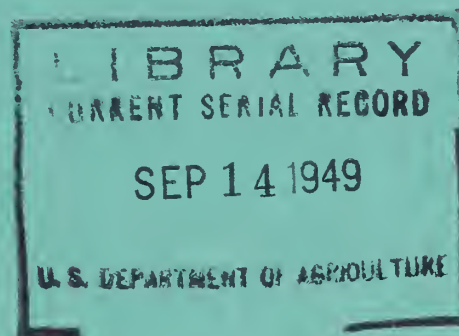
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FEDERAL-STATE
COOPERATIVE SNOW SURVEYS and
IRRIGATION WATER FORECASTS

for
MONTANA

April 1, 1949



by
Montana Agricultural Experiment Station
and
Division of Irrigation, Soil Conservation Service
United States Department of Agriculture

in cooperation with

U.S. Forest Service •••• U.S. National Park Service •••• U.S. Bureau of Reclamation •••• U.S. Geological Survey
and State Engineer of Montana

FEDERAL-STATE COOPERATIVE
SNOW SURVEY AND IRRIGATION WATER FORECASTS

FOR

MONTANA

Upper Missouri and Upper Columbia

Report Prepared
by

Ashton R. Codd: Hydraulic Engineer
Soil Conservation Service

and

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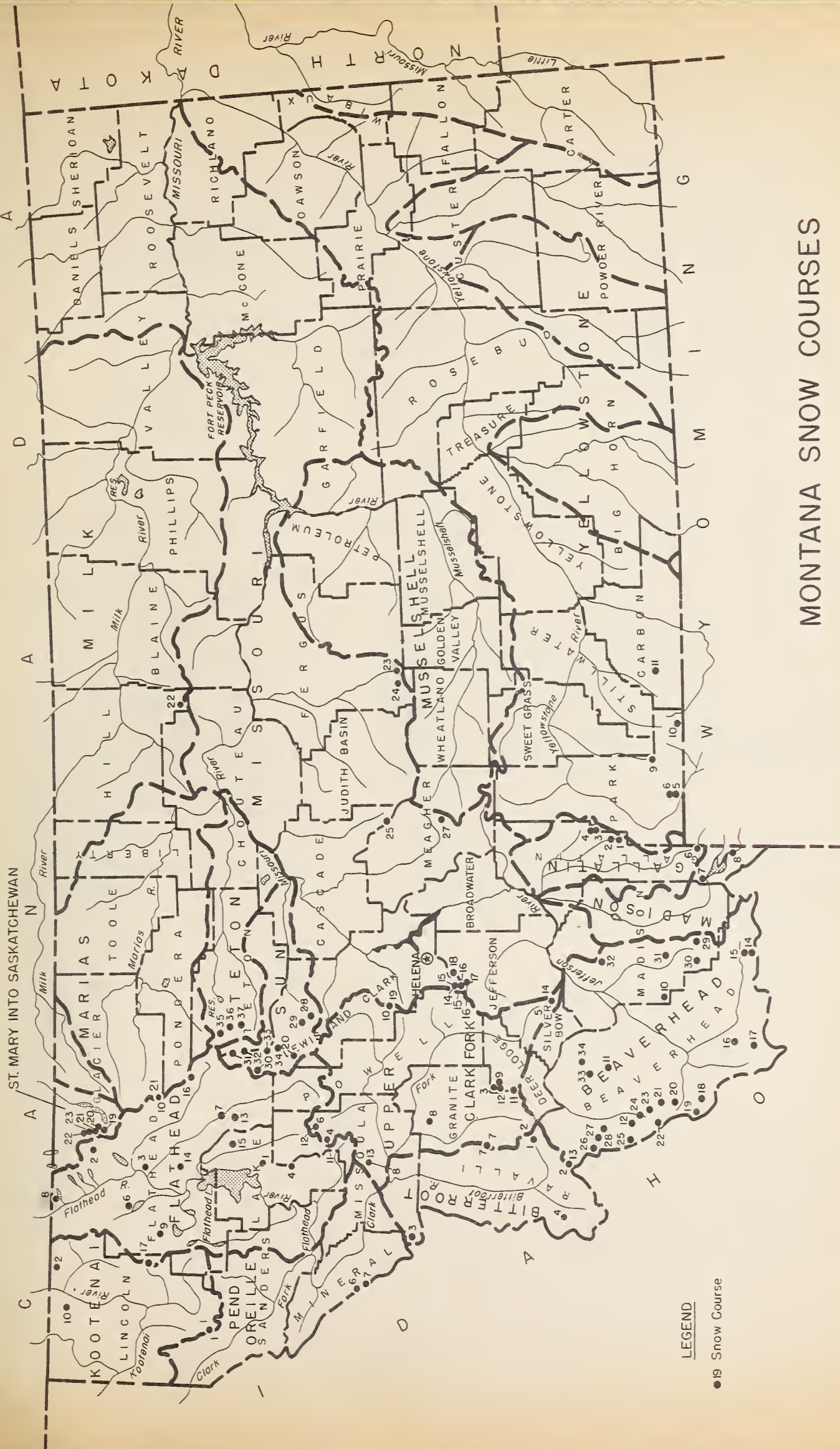
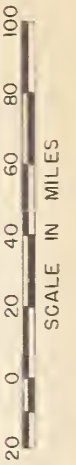
Division of Irrigation
Soil Conservation Service

and

Montana Agricultural Experimental Station
Bozeman, Montana

MONTANA SNOW COURSES

JANUARY, 1949



LEGEND

● 19 Snow Course

INDEX TO MONTANA SNOW COURSES

Name	Montana No.	Elev.	Location			Record Began	Measuring Dates ^a	Measured By ^b	Name	Montana No.	Elev.	Location			Record Began	Measuring Dates ^a	Measured By ^b
			Sec.	Twp. Range	Long.							Lat.	Twp. Range	Long.			
MISSOURI RIVER DRAINAGE									COLUMBIA DRAINAGE								
JEFFERSON RIVER									KOOTENAI RIVER								
White Pine Ridge	16	8850	18	14S	9W	1948	3,4	1	Barre Mountain	1	6000	1	25N	31N	1937	4,5	1
Linekiln	17	6950	5	15S	9W	1948	3,4	1	Bluebird Basin	2	6800	24	37N	26N	1937	4,5	1
Lakeview Ridge	14	7400	27	14S	2W	1948	3,4,5	9	Red Mountain	10	6000	4	36N	29W	1937	3,4,5	1
Lakeview Canyon	15	6930	26	14S	2W	1948	3,4,5	9	UPPER CLARK FORK								
Trail Creek	18	7090	15	10S	15W	1948	3,4	1	Chessman Reservoir	1	6200	2	8N	5W	1936	1,2,3,4,5	2
Lenhi Pass	19	7460	9	10S	15W	1948	3,4	1	East Fork Ranger Station	2	5400	16	2N	17N	1937	4	1
Terrell Creek	20	6650	14	9S	15W	1948	3,4	1	Intergaard	3	6450	6	5N	12W	1935	2,3,4	3
Selway Junction	21	6800	27	8S	15W	1948	3,4	1	North Fork Jocko	4	6330	3	17N	17W	1941	3,4	4
Gold Stone	22	8100	11	8S	16W	1948	3,4	1	Pipestone Pass	5	7200	11	1N	7W	1938	2,3,4,5	1
Bloody Dick	23	7600	12	8S	16W	1948	3,4	1	Rainy Lake	6	4300	11	18N	16W	1947	3,4,5	1
Jahnke Creek	24	7340	25	7S	16W	1948	3,4	1	Skalkaho Summit	7	7258	30	6N	17W	1937	4,5	1
Miner Forks	25	7300	24	6S	17W	1948	3,4	1	Slide Rock Mountain	8	7100	26	10N	16N	1937	4	1
Miner Lake	12	6720	10	6S	16W	1945	3,4,5	1	Southern Cross	9	6500	9	5N	13W	1939	2,3,4	3
Big Hole Pass	26	7440	28	3S	18W	1948	3,4	1	Stemple Pass	10	6500	16	13N	7W	1934	3,4,5	2
Below Big Hole Pass	27	6900	24	3S	18W	1948	3,4	1	Storm Lake No. 2	11	7780	19	4N	13W	1939	4,5	1
East Boundary	28	6700	22	3S	17W	1948	3,4	1	Stuart Mill	12	6500	19	5N	13W	1939	2,3,4	3
Gibbons Pass	13	7100	4	2S	19W	1934	2,3,4,5	1,2	Stuart Mountain #1	13	7400	6	14N	16N	1936	3,4,5	1
Elk Horn	11	8450	16	4S	12W	1934	3,4,5	2	Tennile Creek, Lower	14	6250	13	8N	6W	1935	1,2,3,4,5	2
Anderson Meadow	33	7000	18	3S	12W	1948	3,4	1	Tennile Creek, Middle	15	6800	13	8N	6W	1934	1,2,3,4,5	2
Wise River	34	6300	15	2S	12W	1948	3,4	1	Tennile Creek, Upper	16	8000	19	8N	5W	1935	1,2,3,4,5	2
Upper Cottonwood	29	8400	30	10S	2W	1948	3,4	1	BITTERROOT RIVER								
Cottonwood	30	5500	25	10S	3W	1948	3,4	1	East Fork Ranger Station	1	5400	16	2N	17W	1937	4	1
Vigilante	31	6125	28	6S	3W	1948	3,4	1	Gibbons Pass	2	7100	4	2S	13W	1934	2,3,4,5	1,2
Flashlight	10	6950	22	8S	7W	1945	3,4,5	1	Mud Creek Pasture	3	4500	24	11N	24W	1937	2,3,4,5	1
Tobacco Root	32	6500	18	4S	3W	1948	3,4	1	Nezperce Camp	4	5580	19x20	1S	23W	1937	3,4	1
MADISON RIVER									Skalkaho Summit	7	7258	30	6N	17W	1937	4,5	1
Hebgen	7	6550	22	11S	3E	1934	1,2,3,4,5	2	Stuart Mountain #1	6	7400	6	14N	16W	1936	3,4,5	1
West Yellowstone	8	6700	34x35	13S	5E	1934	1,2,3,4,5	2	FLATHEAD RIVER								
GALLATIN RIVER									Big Creek	1	6750	6x7	22N	16W	1941	4,5	4
Devil's Slide	1	8100	14	5S	6E	1935	3,4,5	2,6	Cattle Queen	2	4700	7	35N	17W	1939	3,4	5
Hood Meadow Extension	2	6600	22	4S	6E	1934	3,4,5	2,6	Desert Mountain	3	5600	24	31N	15W	1937	3,4,5	1
Mystic Lake #1 & #2	3	6600	30	3S	7E	1935	1,2,3,4	6,7	Elk Mountain	4	6750	1	20N	15W	1941	3,4	4
New World Trail	4	6700	24	3S	6E	1939	3,4	6,7	Goat Mountain	5	7000	47°39'	112°54'	1934	5,4	2	
21 Mile	6	7150	1	11S	5E	1934	2,3,4,5	2	Hell Roaring Creek Divide	6	5770	35	32N	22W	1942	4,5	1
YELLOWSTONE RIVER									Horse Ridge c	7	5200	8	25N	15W	1937	4,5	1
Crevice #1	5	8400	29	9S	9E	1935	3,4	1	Kishenehn	8	4300	7	37N	21W	1946	4,5	5
Crevice #2	6	8150	26	9S	9E	1935	3,4	1	Logan Creek	9	4300	34	30N	24W	1937	3,4	1
Independence	9	8000	22	7S	12E	1940	3,4	6	Marias Pass	10	5250	48°19'	113°21'	1934	1,2,3,4,5	2	
Cooke City	10	7400	25	9S	14E	1937	1,2,3,4,5	5	North Fork Jocko	11	6220	3	17N	17W	1941	3,4,5	4
Camp Senia	11	7890	2	8S	18E	1938	3,4	1	Rainy Lake	12	4300	11	18N	16W	1947	3,4,5	1
MUSSELSHELL RIVER									Spotted Bear Mountain	13	7000	23	25N	15W	1948	3,4	1
Grasshopper	27	7000	19	9N	8E	1938	3,4	1,6	Strawberry Lake	14	6500	11	28N	15W	1948	3,4	1
MISSOURI RIVER MAIN STEM									Trinkus Lake	15	6500	9	25N	17W	1948	3,4	1
Pipestone Pass	14	7200	11	1N	7W	1938	2,3,4,5	1	Snow Laboratory Station #13	16	5240	10	29N	14W	1946	1,2,3,4,5	2
Tennile Creek, Lower	15	6250	13	8N	6W	1935	1,2,3,4,5	2	Brush Creek	17	5000	13	30N	26W	1937	3,4	1
Tennile Creek, Middle	16	6800	13	8E	6W	1934	1,2,3,4,5	2	PEND OREILLE RIVER								
Tennile Creek, Upper	17	8000	19	2N	6W	1935	1,2,3,4,5	2	Barre Mountain	1	6000	1	25N	31W	1937	4,5	1
Chessman Reservoir	18	6200	2	8N	5W	1936	1,2,3,4,5	2	Freezeout Summit	6	7000	21	15N	27W	1937	3,4	1
Stemple Pass	19	6900	16	13N	7W	1934	3,4,5	2	Hoodoo Creek	7	6200	9x16	14N	27W	1937	3,4	1
Crystal Lake	24	6100	24	12N	17E	1941	3,4	1,6	SASKATCHEWAN RIVER DRAINAGE								
Kings Hill	25	7950	35	13N	7E	1937	3,4,5	2	ST. MARY RIVER								
Grasshopper	27	7000	19	9N	8E	1938	3,4	1,6	Piegan Pass #6	19	6500	48°45'	113°42'	1922	5	2,8	
SUN RIVER									Piegan Pass #4	20	5000	48°46'	113°40'	1922	5	2,8	
My Lake	30	7300	21	23N	12W	1949	3,4	1	Mount Allen	21	7000	48°44'	113°40'	1922	5	2,8	
Wrong Creek Ridge	31	6800	17	25N	10W	1949	3,4	1	Ptarmigan #8	22	5800	48°50'	113°42'	1922	5	2,8	
Wrong Creek	32	5700	32	25N	10W	1949	3,4	1	Iceberg Lake	23	6000	48°50'	113°42'	1922	5	2,8	
Gates Park	33	5300	31	24N	10W	1949	3,4	1	SASKATCHEWAN RIVER DRAINAGE								
Cabin Creek	34	5400	33	23N	10W	1949	3,4	1	ST. MARY RIVER								
o Bull	28	5600	36	20N	10W	1948	3,4	1	Piegan Pass #6	19	6500	48°45'	113°42'	1922	5	2,8	
Bench Mark	29	5600	9	20N	10W	1948	3,4	1	Piegan Pass #4	20	5000	48°46'	113°40'	1922	5	2,8	
Joat Mountain	20	7000	21	22N	10W	1934	3,4	2	Mount Allen	21	7000	48°44'	113°40'	1922	5	2,8	
TETON RIVER									Ptarmigan #8	22	5800	48°50'	113°42'	1922	5	2,8	
Fright Creek	35	6000	13	26N	10W	1948	3,4	1	Iceberg Lake	23	6000	48°50'	113°42'	1922	5	2,8	
West Fork	36	6000	6	25N	9W	1948	3,4	1	SASKATCHEWAN RIVER DRAINAGE								
Waldron	37	5600	16	25N	9W	1948	3,4	1	ST. MARY RIVER								
MARIAH RIVER									Piegan Pass #6	19	6500	48°45'	113°42'	1922	5	2,8	
Marias Pass	21	5250	48°19'	113°21'	1934	1,2,3,4,5	2	Piegan Pass #4	20	5000	48°46'	113°40'	1922	5	2,8		
MILK RIVER									Mount Allen	21	7000	48°44'	113°40'	1922	5	2,8	
Rocky Boy	22	5200	15	28N	16E	1942	3,4	6	Ptarmigan #8	22	5800	48°50'	113°42'	1922	5	2,8	
									Iceberg Lake	23	6000	48°50'	113°42'	1922	5	2,8	

a. Numerals 1,2,3,4, and 5 refer to January 1, February 1, March 1, April 1, and May 1.

b. Numerals refer to Agency that secures the snow survey, as follows:

- U. S. Forest Service
- U. S. Geological Survey and U. S. Engineer Corps
- Montana Power Company
- U. S. Indian Service
- National Park Service
- Montana Experiment Station
- City of Bozeman
- Dominion Water and Power Bureau
- U. S. Fish and Wildlife Service

c. Discontinued 1943-1947

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9. U. S. Fish and Wildlife Service

c. Discontinued 1943-1947

SUMMARY FORECAST
FOR
MONTANA EAST OF CONTINENTAL DIVIDE

* * * * *

* The outlook for Irrigation water supply for the 1949 season is "EXCELLENT".

* Snow surveys in the head water tributaries of the upper Missouri river indicate

* that the 1949 snow pack water content is in general paralleling that of 1948;

* most measurements show that this year's water content is 15 to 20 % higher

* than last year at this date.

* There is sufficient water to cause extremely high peak flows in all tributaries

* depending entirely upon the rapidity of snow melt and the possibility of ac-

* companying heavy rains. The low elevation measurements show a higher percent-

* tage of average water content than do the higher elevation courses. This

* would indicate a greater possibility of high peak flows and a possibility of

* a prolonged runoff season.

* Precipitation over the central and eastern division of the state has, in

* general, been below normal for the winter months.

* Reservoir storage at this time of year is good.

* * * * *

MISSOURI RIVER DETAIL CONDITIONS AND FORECAST

Gallatin River: Snow surveys made in this basin indicate an above average water content ranging from 106% to 135% of the ten year average. It is anticipated that the May-June runoff will be 269,000 acre feet at the gauging station at Gateway or about 112% of normal.

Madison River: Snow survey measurements made in this basin indicate that the water content is a little higher in average than the Gallatin River. Here the water content percentage on an average, ranges from 120% to 140%. At West Yellowstone on the Madison River it is anticipated that 120,000 acre feet will flow during May and June or 143% of the 10 year average.

Jefferson River: Short snow survey records in this basin make prediction difficult but judging from the water experienced in the streams last season; and with the water content on 27 courses higher than last year, this would seem a very critical condition. An ideal snow melt season would have to exist if a normal runoff season is to be experienced to prevent damaging peak flows to lowlands, bridges, and live stock if precautions are not taken.

Main Stem of Missouri: There should be above normal flow between Three Forks and Fort Benton as indicated by snow survey measurements at Stemple pass with 13.5 inches of water this season and 10.3 inches last season and compared with a 10 year average of 8.7 inches. Other courses indicate a similar comparison. It is anticipated that 2,296,000 acre feet of water will pass Fort Benton during May and June, about 160% of average.

Sun River: New snow survey courses established in this basin last season indicate that there is approximately 30% more water on the basin than last year, the Teton River is relatively the same percentage of comparison.

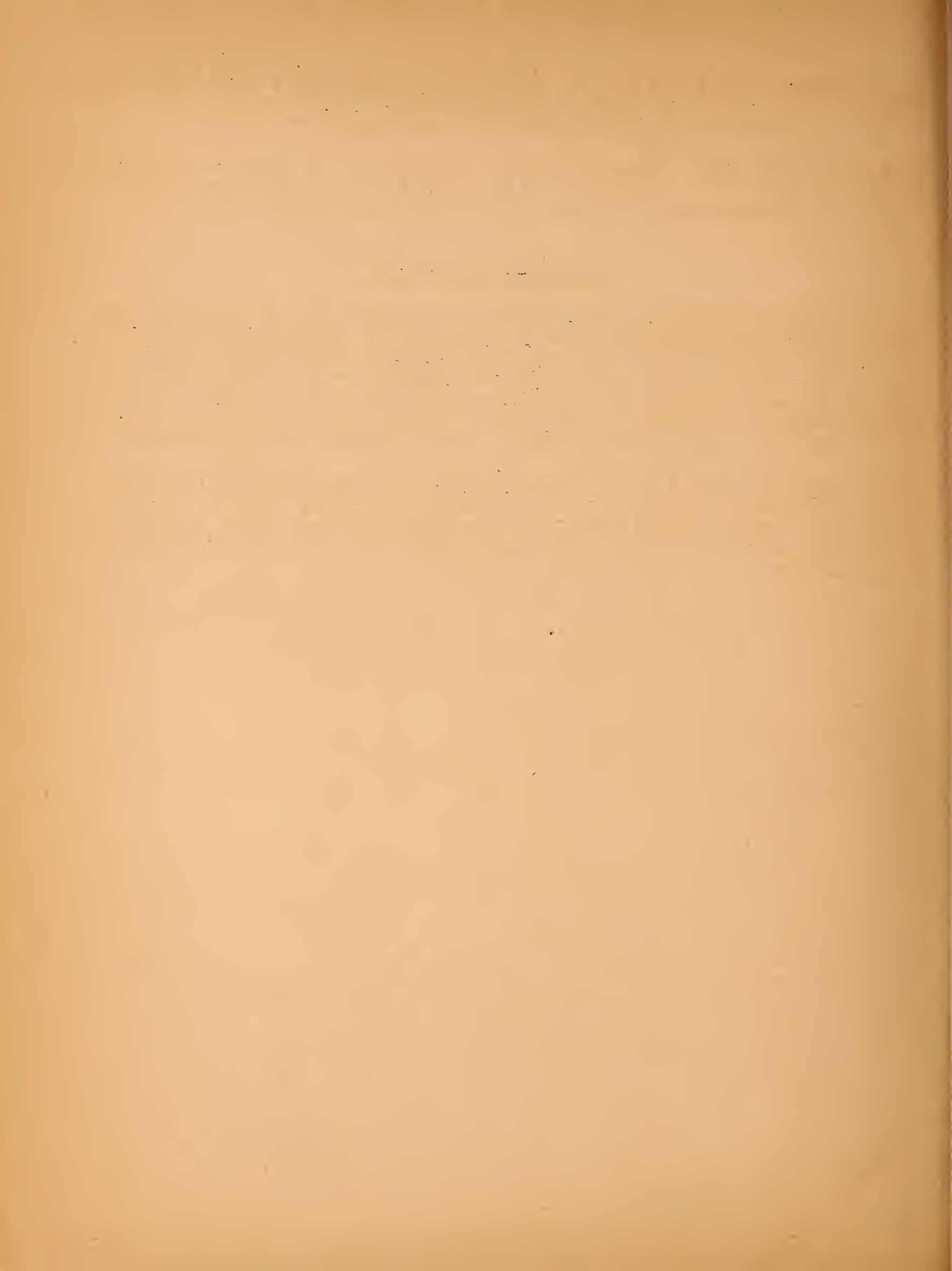
Marias River: Measurements of water content of the snow pack in this basin indicate 135% of average with 21.4 inches of water at Marias Pass as compared with 18.9 inches last season and 15.8 inches for a 13 year average.

Milk River: Snow survey measurements made at Rocky Boy snow course in the Little Rocky Mountains show a recovery over the March first measurements and this course now indicates 120% of average for the past seven years.

YELLOWSTONE RIVER BASIN

Main Stem Above Livingston: Snow survey measurements made by the National Park Service in Yellowstone National Park indicate that the water content at Canyon, Lake, Norris Junction, Cook City and near Mammoth is about 40% above average. This figure would assure an ample supply of irrigation water for the Yellowstone Valley. It is anticipated the 1,356,000 acre feet of water will flow by Corwin Springs during May and June or about 125% of average for 12 years; Also 887,000 feet during July, August and September or 134% of average for those months.

Clarks Fork River: Water content measurements made at Cook City and Camp Senia in this river basin show about the same conditions as 1948, slightly lower at Camp Senia. The snow water content averages 127% of average and it is estimated that 58,400 acre feet will flow past the gauging station at Chance during May, June, and July.



SUMMARY FORECAST
FOR
MONTANA, WEST OF CONTINENTAL DIVIDE

* * * * *

* The outlook for irrigation water supply for the 1949 season on April 1 is *
* "EXCELLENT." Snow survey measurements made in the headwaters of the Columbia *
* River indicate that there will be an abundant supply of water during the *
* spring runoff season. Dependent entirely upon the progress of melting snow *
* the probability of accompanying rain to push the peak flows to such heights *
* as to cause considerable damage to lowlands, bridges, and head work. *
* * * * *

* April snow surveys in almost every tributary drainage indicate that the low *
* elevation courses show a higher percentage of average as do the high eleva- *
* tion courses. This would indicate that the spring runoff will probably be *
* prolonged if temperatures are moderate; on the other hand should there be an *
* extremely warm spell with a good rain, exceedingly high stream flow would *
* develop very quickly. *
* * * * *

* Due to the lack of precipitation during the fall months it is expected that *
* this lack of soil priming and abnormal cold winter will materially effect *
* the spring runoff. *
* * * * *

* Reservoir storage is good. Some of the large reservoirs have been drawn *
* down to receive the anticipated large runoff. *
* * * * *

* Snow conditions in general are paralleling 1948 and a little higher in a *
* good many places. *
* * * * *

WATER SUPPLY OUTLOOK
UPPER COLUMBIA RIVER

Bitterroot River: Water content measurements made at seven snow survey courses in and adjacent to this basin show average of 24 inches of water which is 80% above average of 12 years record. It is anticipated that the April-September runoff volume will be 613,000 acre feet at Darby or 145% of average.

Clark Fork River: Snow survey water content measurement at 16 representative courses indicate that the snow pack is approximately 65% above normal and that the April-September runoff above Missoula will be 2,062,000 acre feet or 161% of average.

Flathead River: At 19 representative snow courses in and close to this basin the average water content shows approximately 160% of the past 12 years average. The April-September runoff should approximate 7,218,000 acre feet or 157% of average at Columbia Falls.

The April-September runoff volume on the Clark Fork River at Heron should approximate 14,200,00 acre feet on 154% of average.

Kootenai River: At fifteen snow survey courses measured by the Canadian Government and the Soil Conservation Service in the Upper Kootenai Basin the water content in the snow pack indicate close to 120% of the past 10 years average. The April-October runoff at Newgate B.C. should be approximately 4,500,000 acre feet.

PRELIMINARY ESTIMATES OF RUNOFF AT A NUMBER OF
REPRESENTATIVE GAUGING STATIONS IN MONTANA

<u>Name of Stream</u>	<u>Period and Volume Forecast In</u>	
	<u>Acre Feet</u>	
MISSOURI BASIN	<u>May - June</u>	<u>July-August-Sept.</u>
Gallatin River at Gateway	269,000	126,000
Hyalite Creek at Ranger Station	19,000	10,000
North Fork Musselshell at Delpine	5,000	2,975
Yellowstone River at Corwin Springs	1,356,000	887,000
Clarks Fork River at Chance	58,000	<u>May-June-July</u>
Red Lodge River above Cooney Reservoir	25,800	11,000
Missouri River at Fort Benton	2,296,000	-----
COLUMBIA RIVER BASIN	<u>April-June</u>	<u>April-September</u>
Bitterroot River at Darby	521,000	613,000
Clark Fork above Missoula	1,592,000	2,062,000
Clark Fork below Missoula	2,830,000	3,430,000
Clark Fork at St. Regis	3,700,000	4,440,000
Flathead River at Columbia Falls	5,674,000	7,218,000
Flathead River at Polson	5,900,000	7,850,000
Clark Fork River at Plains	9,850,000	12,460,000
Clark Fork River at Heron	11,450,000	14,200,000

Note: All estimated volumes subject to a discrepancy of plus or minus 10 to 15%.

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STORAGE IN RESERVOIRS OF MONTANA

MISSOURI RIVER BASIN

AS OF MARCH 31, 1949

RESERVOIR	Location or on Diversion from	Usable Capacity	Contents This Month End	Contents March 1948
Lake Sewall	Missouri	37,800	32,870	36,980
Hauser Lake	Missouri	52,090	29,860	45,730
Ft. Peck Res.	Missouri	19,000,000	13,140,000	13,440,000
Ruby Res.	Ruby	38,500		
Harrison Lake	Willow Cr.	17,760		
Hebgen Res.	Madison River	345,000	268,400	257,600
Madison Res.	Madison River	41,000	35,620	38,010
Smith River Res.	Smith River	10,700		
Gibbons Res.	N. Fk. Sun River	105,000	76,060	64,410
Willow Creek	N. Fk. Sun-Willow Cr.	32,300	19,410	17,170
Pishkun Res.	N. Fk. Sun River	32,000	15,920	20,840
Lower Two Medicine L.	Two Medicine River	14,000		0
Four Horns Res.	Badger Creek	20,000	9,800	7,360
Birch Creek Res.	Birch Creek	30,000		20,990
Lake Francis Res.	Birch Creek	112,000		102,650
Ackley Lake	Judith River	5,820		4,690
Durand Res.	N. Fk. Musselshell	7,010	3,750	5,000
Dead Man Basin	Musselshell River	52,500		
Martinsdale Res.	So. Fk. Musselshell	23,100	13,510	8,130
Fresno Reservoir	Milk River	127,200	74,470	77,420
Nelson Reservoir	Milk River	66,800	5,630	32,160
Mystic Lake	W. Rosebud Creek	20,800		5,750
Glacier Lake	Rock Creek	4,200	5,390	6,640
Cooney Res.	Red Lodge Creek	27,500		16,150
Tongue Res.	Tongue River	73,900		
Sherburne Lake Res.	Swiftcurrent Creek	66,100		
Lake Helena	Missouri River	10,450	1,600	7,200

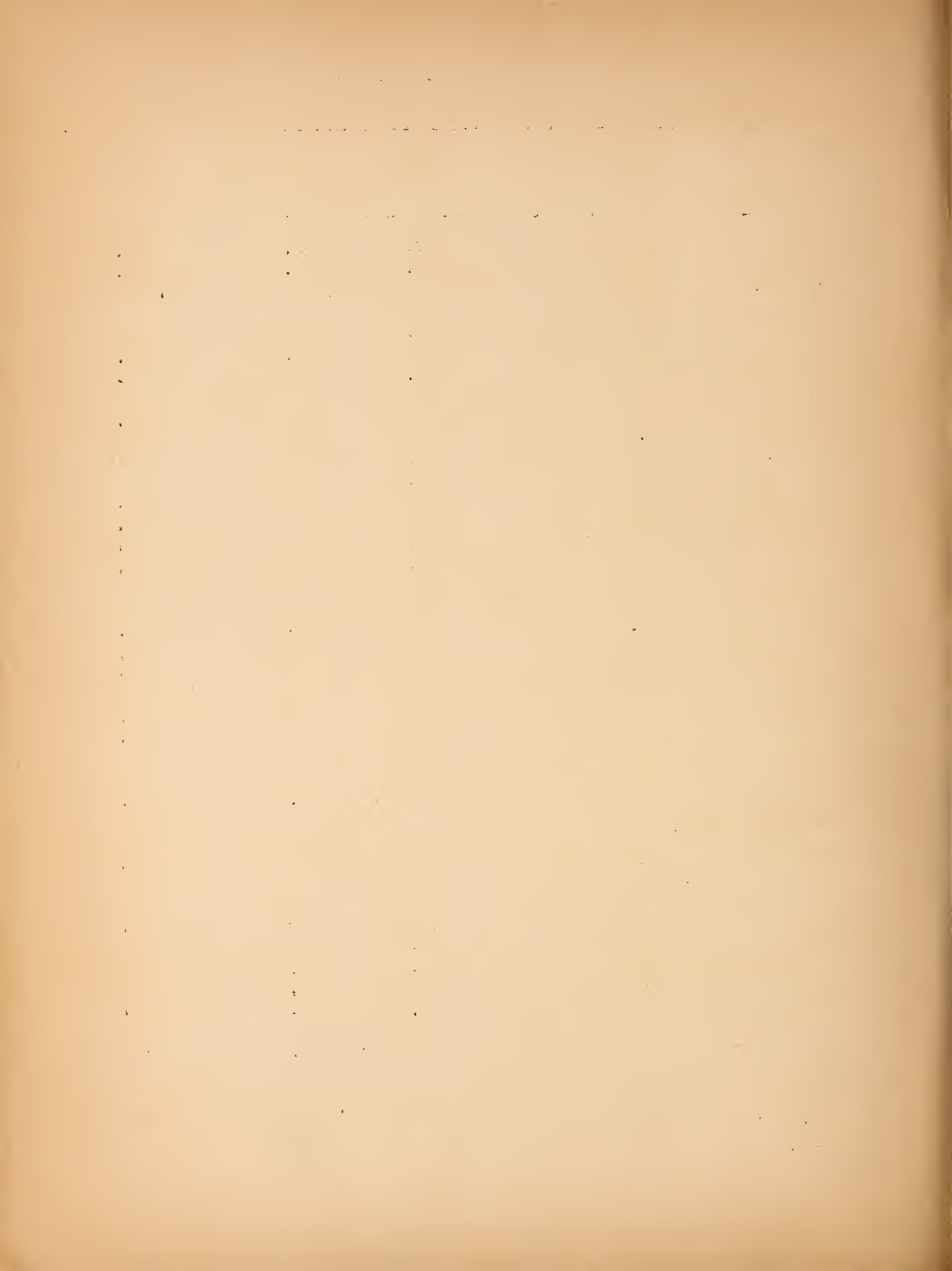
COLUMBIA RIVER BASIN

Georgetown Lake	Flint Creek	31,000	26,440	25,690
E. Fk. Rock Cr. Res.	E. Fk. Rock Cr.	16,040		
Nevada Creek Res.	Nevada Creek	12,600	7,580	
W. Fk. Bitterroot Res.	E. Fk. Bitterroot	31,700	10,000	10,000
Como Lake	Rock Creek	34,800		
Flathead Lake (Sommers)	Flathead River	1,791,000	561,700	558,200
Little Bitterroot	Little Bitterroot	37,100*	36,120	24,360
Dry Fork Res.	Dry Fork Creek	6,700*	3,810	3,690
Mission Valley Reservoirs	Mission Valley (Flathead River)	105,000**	32,293	51,650

*Comprise two Reservoirs on Dry Creek.

*Comprise two Reservoirs on Little Bitterroot River.

**Comprise nine small Reservoirs on Mission Valley Project Indian Reclamation Service.



U.S. DEPARTMENT OF COMMERCE, WEATHER BUREAU
STATE OF MONTANA, MONTHLY PRECIPITATION FOR
OCTOBER, 1948 - MARCH 31, 1949

STATIONS	OCTOBER 1948		NOVEMBER 1948		DECEMBER 1948		JANUARY 1949		FEBRUARY 1949		MARCH 1949		TOTAL PRECIPITATION TO DATE
	Pre.	Dep.	Pre.	Dep.	Pre.	Dep.	Pre.	Dep.	Pre.	Dep.	Pre.	Dep.	
<u>WEST OF DIVIDE</u>													
Butte	.36	-0.43	.41	0.00	0.94	.50	0.50	0.10	0.91	.49	.64	0.00	3.76
Deer Lodge	.06	-0.62	.77	0.22	1.14	.63	0.53	-0.06	0.86	.43	.08	-0.53	3.44
Hamilton	.44	-0.47	1.53	0.72	1.32	.61	0.22	-0.55	1.57	.85	1.09	0.50	6.27
Kalispell	.40	-0.66	1.50	0.15	1.02	-.43	1.07	-0.50	1.28	.17	1.30	0.35	6.57
Missoula	0.23	-0.72	0.92	0.02	1.04	.09	0.34	-0.51	0.97	.17	0.97	0.15	4.47
<u>CENTRAL DIVISION</u>													
Babb	0.10	-1.08	0.44	-0.55	0.31	-.63	1.24	---	0.71	-.11	0.69	-0.42	3.49
Dillon Normal Sch.	0.15	-0.69	0.35	-0.45	0.95	.21	0.62	-0.21	0.57	-.25	0.20	-0.96	2.84
Fort Benton	0.04	-0.68	0.70	0.11	0.63	.12	0.99	0.33	0.78	.29	1.08	-0.54	4.22
Great Falls	.08	-0.78	0.39	-0.29	0.53	-.12	1.40	---	0.79	.24	1.11	0.25	4.30
Havre	.09	-0.58	-0.26	-0.35	0.52	-.09	0.44	-0.29	0.49	-.03	0.41	-0.10	2.21
Helena WBO	.05	-0.56	0.61	0.16	0.80	.33	0.66	0.10	0.59	.22	0.69	-0.10	3.40
Livingston	.21	-0.96	0.67	-0.13	0.88	.28	1.14	---	0.42	-.12	1.03	0.17	4.35
Lewistown Arpt.	.01	-0.35	1.02	0.81	---	---	---	---	---	---	---	---	---
Mystic Lake	.24	-1.60	1.13	-0.45	1.77	.73	1.40	---	1.69	.61	3.32	1.28	9.55
<u>EASTERN DIVISION</u>													
Billings #2	.01	-1.30	0.18	0.18	0.73	.23	1.46	0.83	0.48	.06	0.69	-0.15	3.55
Circle	.06	-0.79	0.63	.06	0.45	-.30	0.57	---	0.31	-.30	0.24	-0.76	2.26
Frazer	.03	-0.85	0.63	.10	0.95	.56	0.55	0.14	0.46	-.12	0.25	-0.45	2.87
Malta	.00	-0.73	0.25	-.16	0.58	.12	0.16	-0.31	0.28	-.09	0.17	-0.37	1.44
Mildred	T	-0.73	1.67	1.30	0.41	.09	0.98	0.64	0.41	.14	0.34	-0.08	3.81
Medicine Lake	0.16	-0.59	1.15	0.82	0.48	.20	0.09	-0.23	0.14	-.18	0.94	0.53	2.95
Miles City	T	-0.90	0.49	-.08	0.31	-.32	0.85	0.19	---	---	0.51	-0.35	---
Fort Peck	T	-0.75	0.14	-.33	0.16	-.12	0.16	---	0.23	-.04	0.15	-0.35	0.84

NOTE: Departure from normal figures without a minus sign (-) are plus.

MONTANA SNOW SURVEYS April 1, 1949

SNOW MEASUREMENTS

MISSOURI BASIN DRAINAGE BASIN										SNOW MEASUREMENTS			
AND SNOW COURSE **	State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)				Years of Record			
						April 1 1949	Past Records		Average Data				
							1948	1947	April 1 Avg.		%Avg.		
Jefferson River	Montana	33	7000	3/18	36.4	10.6	6.9	---	---	2			
Anderson Meadow	"	27	6900	3/20	57.8	19.6	12.4	---	---	2			
Below Big Hole	"	26	7440	3/20	69.6	24.5	14.9	---	---	2			
Big Hole Pass	"	23	7600	3/22	49.4	15.2	10.2	---	---	2			
Bloody Dick	"	30	5900	3/25	36.4	11.9	7.3	---	---	2			
Cottonwood	"	29	8400	3/25	37.8	11.6	8.5	---	---	2			
Cottonwood, Upper	"	28	6700	3/20	37.8	11.8	7.5	---	---	2			
East Boundary	"	11	8450	4/2	41.8	13.6	9.4	11.1	8.4	10			
Elk Horn	"	10	6950	4/1	24.1	6.7	5.9	4.2	5.4	4			
Flashlight	"	13	7100	4/1	76.6	29.0	23.0	26.8	20.9	10			
Gibbons Pass	"	22	8100	3/22	58.4	19.0	12.7	---	---	2			
Goldstone	"	24	7340	3/22	45.4	14.4	9.1	---	---	2			
Jahnke Creek	"	15	6930	3/30	41.5	12.7	5.4	---	---	2			
Lakeview Canyon	"	14	7400	3/30	36.4	10.0	5.5	---	---	2			
Lakeview Ridge	"	19	7480	3/14	41.8	11.8	11.1	---	---	2			
Lemhi Pass	"	17	6950	3/16	10.8	4.1	2.8	---	---	2			
Limekiln	"	25	7300	3/21	46.6	13.8	10.3	---	---	2			
Miner Forks	"	12	6720	3/21	37.9	10.6	19.0	10.2	9.0	4			
Miner Lake	"	14	7200	4/4	31.2	7.9	7.4	7.0	5.4	10			
Pipestone Pass	"	21	6800	3/15	42.2	12.8	6.8	---	---	2			
Selway Junction	"	20	6650	3/15	25.6	6.0	3.5	---	---	2			
Terrell Creek	"	32	6900	3/24	41.3	13.3	10.8	---	---	2			
Tobacco Root	"	18	7090	3/14	37.4	10.4	10.5	---	---	2			
Trail Creek	"	31	6125	3/24	Bare	None	2.2	---	---	2			
Vigilante	"	16	8850	3/16	28.2	7.2	7.8	---	---	2			
White Pine Ridge	"	34	6300	3/18	23.0	7.4	4.7	---	---	2			
Wise River	"		6800	3/28	34.0	10.7	8.1	6.1	8.5	2			
*Camp Creek	Idaho									13			
Average For Drainage					39.2	12.2	8.7						
*Course on adjacent basin.													

*Course on adjacent basin.

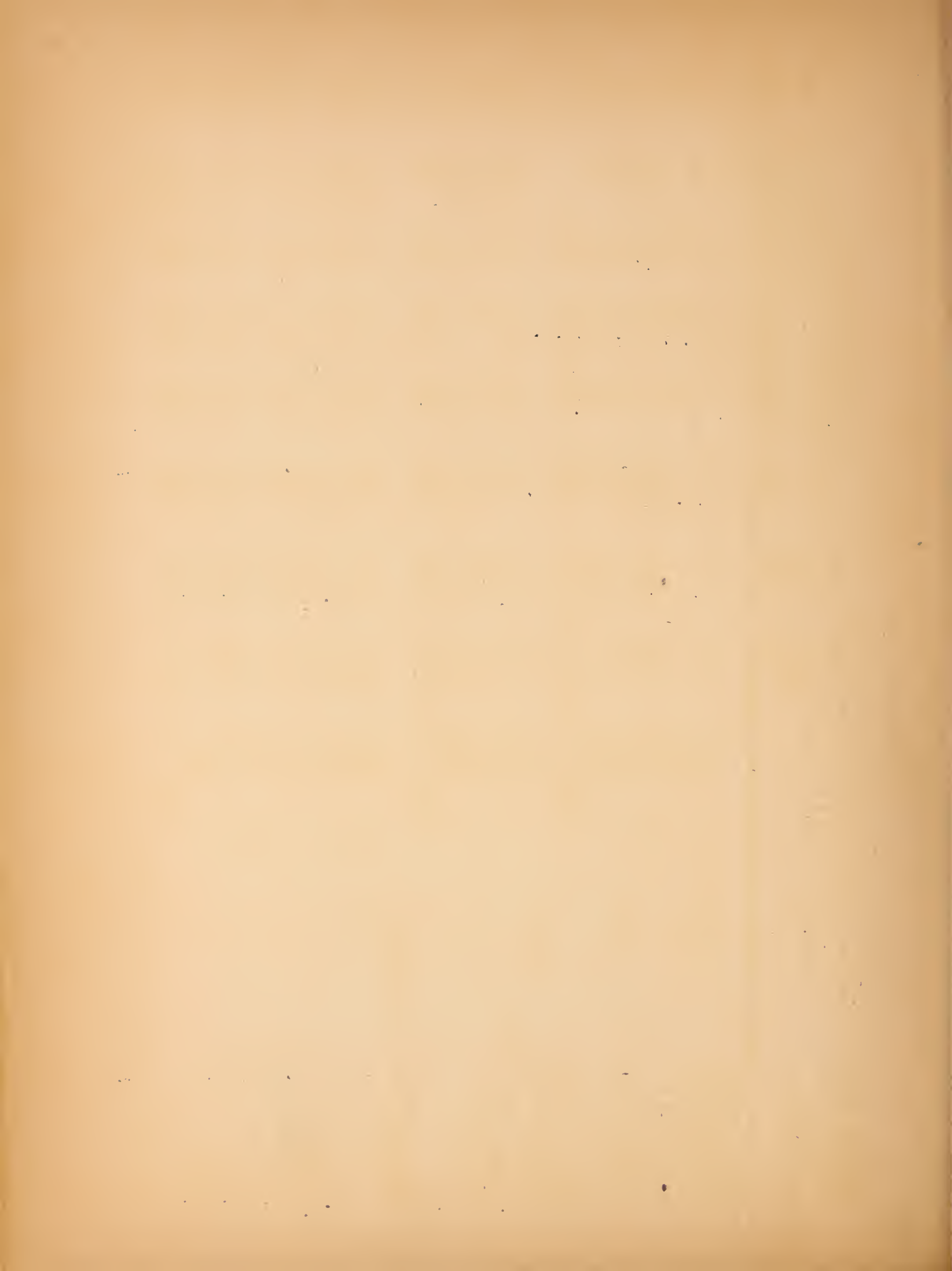
**Location of course shown on Index Map.

MONTANA SNOW SURVEYS April 1, 1949

MISSOURI BASIN		SNOW MEASUREMENTS										Years of Record
DRAINAGE BASIN		State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)			Average Data		
AND	SNOW COURSE **						April 1 1949	Past Records 1948 : 1947	Avg.	%Avg.	April 1	
<u>Madison River</u>												
Hebgen Lake	Montana	7	6550	3/31	42.4	14.6	11.7	11.0	11.9	123	123	12
Norris Basin	"	7	7500				8.6	8.8	9.5			13
21 Mile	"	6	7150	3/30	56.3	20.5	14.4	17.8	15.6	133	133	12
West Yellowstone	"	8	6700	3/31	41.5	15.1	9.0	10.4	10.6	143	143	12
Valley View	Idaho		6500	3/25	56.0	18.8	12.8	14.3	14.0	135	135	12
Big Springs	"		6500		75.0	27.8	18.1	20.7	19.5	143	143	12
			Average For Drainage		54.2	19.4	12.4	13.8	10.2			
<u>Gallatin River</u>												
Devil's Slide	Montana	1	8100	3/30	66.2	20.8	27.4	22.6	19.7	106	106	10
Hood Meadow Ext.	"	2	6600	3/30	37.1	10.9	13.3	10.8	8.2	133	133	10
Mystic Lake	"	3	6600	3/26	39.2	11.2	----	7.0	6.8	165	165	12
New World	"	4	6600	3/26	43.6	11.4	16.1	9.2	9.4	123	123	10
21 Mile	"	6	7150	3/30	56.3	20.5	14.4	17.8	15.6	133	133	12
			Average for Drainage		48.5	15.0	17.8	13.5	11.9	132	132	
<u>Main Stem Above Great Falls</u>												
Chessman	Montana	18	6200	4/1	27.6	7.6	9.2	7.4	4.4	173	173	13
Crystal Lake	"	24	6100	4/4	46.3	15.4	16.3	11.9	12.0	128	128	8
Grasshopper	"	27	7000	3/31	31.1	8.1	5.8	7.9	4.5	180	180	11
Kings Hill	"	25	7950	4/2	52.8	16.9	13.1	15.4	12.3	137	137	10
Picnic Grounds	"		6500	3/30	29.2	7.6	----	----	----	----	----	4
Pipestone Pass	"	14	7200	4/4	31.2	7.9	7.4	7.0	5.4	146	146	10
Rimini, Lower	"	15	6250	3/30	33.0	8.8	9.1	7.8	5.9	148	148	13
Rimini, Middle	"	16	6800	3/31	44.4	12.8	14.1	14.2	9.8	131	131	13
Rimini, Upper	"	17	8000	3/31	48.3	14.8	18.1	17.5	12.7	117	117	13
Stemple Pass	"	16	6900	4/2	64.4	13.5	10.3	13.0	8.7	150	150	10
			Average for Drainage		40.8	11.3	11.5	11.3	8.4	145	145	

**Location of course shown on Index Map

**Location of course shown on Index Map.



MONTANA SNOW SURVEYS April 1, 1949

MISSOURI BASIN DRAINAGE BASIN AND SNOW COURSE **		SNOW MEASUREMENTS										Years of Record	
		State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)			Average Data			
							April 1 1949	Past Records		April 1	Avg.		%Avg.
								1948	1947				
<u>Sun River</u>													
Benchmark	Montana	29	5500	3/30	38.0	12.0	9.3	----	----	----	----	2	
Cabin Creek	"	34	5400	4/2	25.6	7.5	----	----	----	----	----	1	
Five Bull	"	28	5600	3/30	27.4	8.8	8.8	----	----	----	----	2	
Gates Park	"	33	5300	4/1	40.8	11.7	----	----	----	----	----	1	
Goat Mountain	"	20	7000	3/31	42.6	15.4	11.7	17.8	8.9	175	----	10	
Wrong Creek	"	32	5700	3/30	50.6	15.7	----	----	----	----	----	1	
Wrong Creek Ridge	"	31	6800	3/31	65.9	22.5	----	----	----	----	----	1	
		Average for Drainage			41.6	13.4	9.9	----	----	----	----		
<u>Teton River</u>													
Fright Creek	"	35	6000	4/1	50.9	17.9	13.4	----	----	----	----	2	
Waldron Creek	"	37	5600	3/31	27.8	9.5	6.0	----	----	----	----	2	
West Fork	"	36	6000	3/31	52.8	19.9	13.6	----	----	----	----	2	
		Average for Drainage			43.8	15.8	11.0	----	----	----	----		
<u>Marias River</u>													
Marias Pass	"	21	5250	3/31	62.9	21.4	18.9	23.3	15.8	135	----	13	
Rocky Boy	"	22	5200	4/1	30.3	6.7	6.7	5.6	5.6	120	----	7	
Snow Lab. 13	"	16	5240	4/1	59.0	19.0	13.7	18.3	----	----	----	3	
		Average for Drainage			50.7	15.7	13.1	15.7	----	----	----		
<u>Milk River</u>													
Rocky Boy	"	22	5200	4/1	30.3	6.7	6.7	5.6	5.6	120	----	7	

**Location of course shown on Index Map.

MONTANA SNOW SURVEYS April 1, 1949

SNOW MEASUREMENTS

MISSOURI BASIN DRAINAGE BASIN AND SNOW COURSE **	State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	SNOW MEASUREMENTS				Years of Record
						Water Content (Inches)				
						April 1 1949	Past Records 1948 : 1947	Average Data		
								April 1	Avg. : %Avg.	

Yellowstone River

Canyon	Wyoming	2	7750	4/1	50.8	14.9	10.2	12.8	10.5	142	11
Crevice #1	Montana	5	8400	3/30	43.6	13.0	13.8	11.2	9.6	136	14
Crevice #2	"	6	8150	3/30	44.3	13.0	14.6	12.2	9.6	136	14
Lake	Wyoming	1	7850	4/1	47.1	15.2	11.5	12.3	10.3	148	13
Lupine	"	3	7300	3/31	48.1	14.2	10.1	9.9	9.9	144	6
Sylvan Pass	"	32	7100		54.1	19.4	14.8	15.0	13.1	148	11
			Average for Drainage		46.8	14.0	12.5	12.2	10.5	141	

Shields River

Porcupine	Montana	7	6500	3/31	32.1	9.1	----	6.1	4.0	227	10
-----------	---------	---	------	------	------	-----	------	-----	-----	-----	----

Boulder River

Independence	Montana	9	8000				----	22.7	17.1		8
--------------	---------	---	------	--	--	--	------	------	------	--	---

Clark Fork of Yellowstone

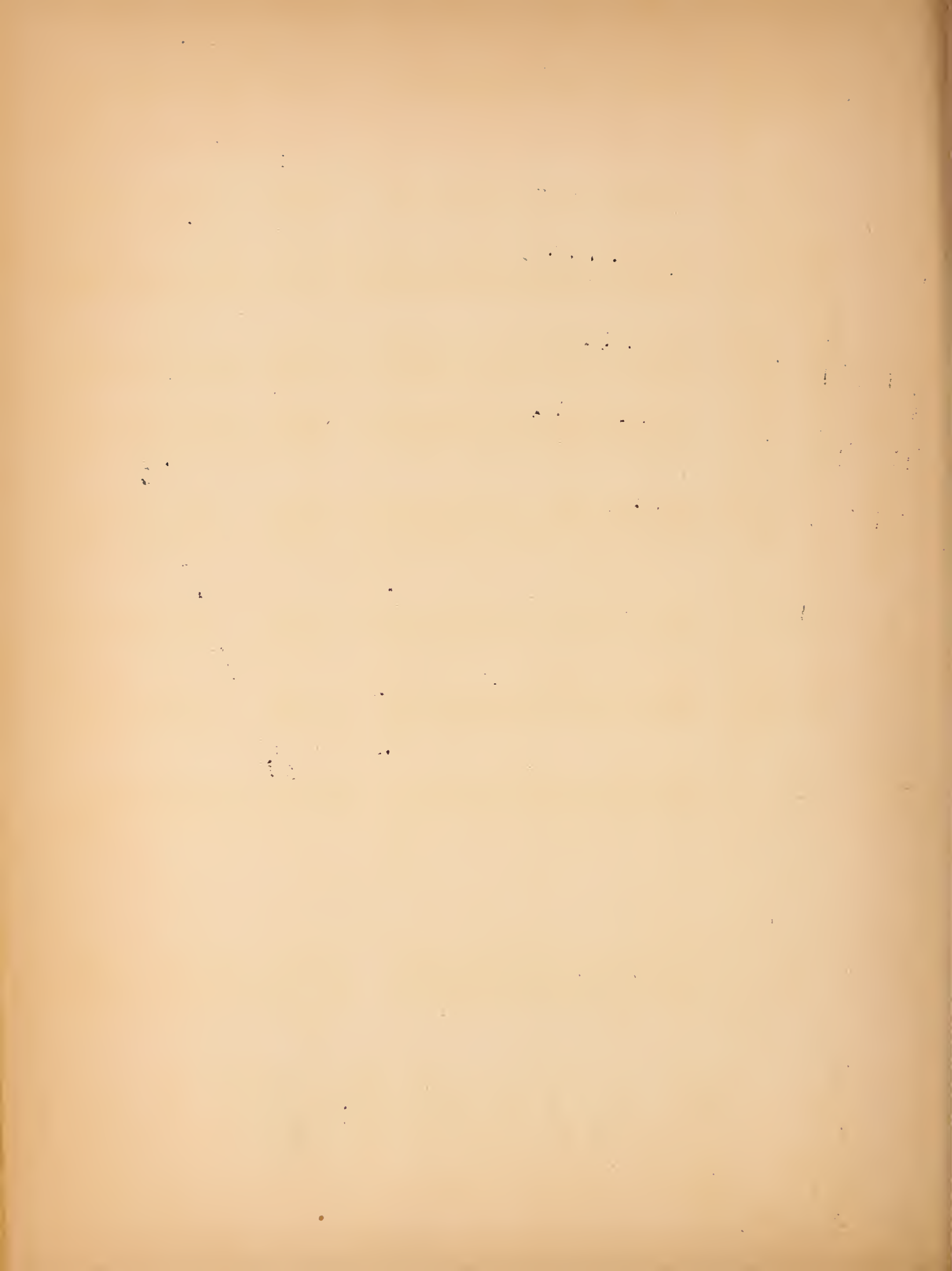
Camp Senia	Montana	11	7890	3/31	30.2	7.6	9.4	9.8	7.3	104	11
Cook City	"	10	7400	4/1	38.9	10.6	10.1	8.3	7.1	149	12
			Average for Drainage		34.6	9.1	8.2	9.0	7.2	127	

**Location of course shown on Index Map.

MONTANA SNOW SURVEYS April 1, 1949

COLUMBIA BASIN DRAINAGE BASIN AND SNOW COURSE **		SNOW MEASUREMENTS										Years of Record
State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)			Average Data				
					April 1 1949	Past Records		April 1 Avg.	%Avg.			
						1948	1947					
Kootenai River												
Baree Mountain	Montana	6000	4/1	131.8	55.2	40.6	51.5	35.5	156	10		
Bluebird Basin	Montana	6800	3/31	109.8	38.2	36.8	40.5	33.2	115	10		
Ferguson	Canada	3000	3/31	50.0	21.1	20.1	26.4	18.3	115	10		
Fernie	Canada	3500	4/2	25.0	7.7	8.4	7.5	6.7	115	11		
Gray Creek	Canada	5100	3/30	65.0	20.5	19.6	---	---	---	---		
Kimberly	Canada	3750	3/31	28.0	7.1	5.5	4.9	4.1	176	10		
Lardeau	Canada	6000	3/31	63.0	12.5	16.1	16.3	14.2	---	13		
Marble Canyon	Canada	5000	3/30	43.0	13.0	13.2	11.3	---	---	3		
Nelson	Canada	3050	3/30	57.0	18.8	15.0	13.3	11.7	161	10		
Red Mountain	Montana	6000	4/1	60.4	21.3	19.2	23.2	16.5	129	10		
Sandon	Canada	3500	3/31	39.0	12.8	11.4	12.3	10.0	128	10		
Sinclair Pass	Canada	4500	3/31	15.0	3.6	4.1	4.7	4.6	75	12		
Smith Creek	Idaho	4800	4/1	124.0	49.3	42.2	51.4	38.1	130	9		
Sullivan Mine	Canada	5100	3/31	50.0	15.2	14.7	13.6	---	---	23		
Upper Elk River	Canada	----	3/30	26.0	8.0	9.1	---	---	---	2		
		Average for Drainage		59.1	20.3	18.4	21.3	17.5				
Upper Clark Fork												
Chessman Res.	Montana	6200	4/1	27.6	7.6	9.2	7.4	4.4	173	13		
East Fk. Ranger Sta.	Montana	5400	3/31	33.0	10.8	6.5	5.5	3.9	277	10		
Intergaard	Montana	6450	3/30	38.6	10.8	10.2	7.0	7.3	148	4		
Limestone Pass	Montana	7000	3/31	118.2	46.3	43.6	---	---	---	2		
Medicine Creek	Idaho	6200				40.3	46.4	33.0		8		
North Fk. Jocko	Montana	6330				46.2	52.0	27.5	146	8		
Pipestone Pass	Montana	7200	4/4	31.2	7.9	7.4	7.0	5.4		10		
Rainy Lake	Montana	4300	3/28	42.5	14.5	11.1	10.1	---	---	3		
Skalkaho Summit	Montana	7258	3/31	83.0	34.6	29.2	29.9	21.5	161	10		
Slide Rock Mt.	Montana	7100	4/1	55.9	18.8	19.2	16.6	12.8	148	12		
Southern Cross	Montana	6500	3/30	26.0	7.4	6.8	3.4	3.9	189	4		
Stemple Pass	Montana	6900	4/2	46.4	13.5	10.3	13.0	8.7	150	13		
Storm Lake #2	Montana	7780	3/31	55.1	16.0	19.7	17.6	13.7	117	10		

**Location of course shown on Index Map.



MONTANA SNOW SURVEYS April 1, 1949

SNOW MEASUREMENTS

COLUMBIA BASIN DRAINAGE BASIN AND SNOW COURSE **											Years of Record
	State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)				Average Data April 1 %Avg.	
						April 1 1949	Past Records		Avg.		
							1948	1947			
Upper Clark Fork (Continued)											
Stuart Mill	Montana	12	6500	3/30	34.1	9.5	6.5	5.5	4.4	216	13
Stuart Mountain #1	"	13	7400	3/30	66.4	23.4	37.5	38.2	29.0	81	12
Tenmile Cr., Lower	"	14	6250	3/30	33.6	8.8	9.1	7.8	5.9	148	13
Tenmile Cr., Middle	"	15	6800	3/31	44.4	17.8	14.2	14.1	9.8	131	13
Tenmile Cr., Upper	"	16	8000	3/31	48.3	14.8	18.1	17.5	12.7	117	13
Average for Drainage						16.4	19.2	17.6	12.7		
Bitterroot River											
East Fk. Ranger Sta.	"	1	5400	3/31	33.0	10.8	6.5	5.5	3.9	277	10
Gibbons Pass	"	2	7100	4/1	76.6	29.0	23.0	26.8	20.8	139	10
Mud Creek Pasture	"	3	4500	3/31	37.8	13.4	8.7	0.0	5.8	231	12
Nezperce Camp	"	4	5580	3/31	56.8	20.8	14.9	12.9	12.0	174	12
Nezperce Pass	Idaho		6575	3/30	68.5	23.8	23.6	20.8	16.1	148	12
Packers Mdw.	Idaho		5700	3/31	85.5	34.4	24.3	24.8	19.1	180	12
Skalkaho Summit	Montana	7	7258	3/31	83.0	34.6	29.2	29.9	21.5	161	10
Stuart Mountain	"	8	7400	3/30	66.4	23.4	37.5	38.2	29.0	81	13
Average for Drainage						23.8	21.0	19.9	16.0		
Flathead River											
Big Creek	"	1	6750				45.8	----	34.4		6
Brush Creek a	"	17	5000	3/29	59.0	19.0	----	----	8.6	221	4
Cattle Queen	"	2	4700				31.2	38.2	27.6		10
Desert Mountain	"	3	5600	3/31	58.0	19.0	14.7	21.2	13.0	145	10
Goat Mountain	"	20	7000	3/31	42.6	15.4	11.7	17.8	8.9	175	10
Hell Roaring Cr. Div.	"	6	5770	3/31	92.0	33.0	28.6	34.1	28.1	118	7
Kishenehn	"	8	4300	3/31	31.8	8.0	5.5	8.7	----	----	3
Limestone Pass	"		7000	3/31	118.2	46.3	43.6	----	----	----	2
Logan Creek	"	9	4300	3/30	45.0	13.0	10.0	10.3	7.2	181	10
Marias Pass	"	10	5250	3/31	62.0	21.4	18.9	23.3	15.8	135	13
North Fork Jocko	"	11	6330				46.2	52.0	27.5		8
Rainy Lake	"	12	4300	3/28	42.5	14.5	11.0	10.1	----	----	3
Spotted Bear Mt.	"	13	7000	3/29	54.0	20.0	15.3	----	----	----	2

**Location of course shown on Index Map.
a Brush Creek Course Re-established (Average 1939 - 1942)

MONTANA SNOW SURVEYS April 1, 1949

COLUMBIA BASIN DRAINAGE BASIN AND SNOW COURSE **										SNOW MEASUREMENTS				
	State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)			Years of Record					
						April 1 1949	Past Records 1948 1947	Average Data April 1 Avg. %Avg.						
Flathead River (Continued)														
Strawberry Lake	Montana	14	6500	3/31	114.0	48.0	43.9	---	---	2				
Trinkus Lake	"	15	6500	4/4	104.0	45.0	47.6	---	---	2				
Trout Lake	"		3700	3/30	53.0	21.0	14.6	---	---	2				
Snow Lab. #13	"	16	5240	4/1	51.7	19.8	13.7	---	---	3				
Wrong Cr. Ridge	"	31	6800	3/31	65.9	22.5	---	---	---	1				
Upper Holland Lake	"			3/29	98.0	37.0	New Course	---	---					
Pend Oreille River		Average for Drainage			62.7	25.2	25.1	23.4	19.0					
Baree Mountain	Montana	1	6000	4/1	131.8	55.2	40.6	51.5	35.5	10				
Benton Mdw.	Idaho		2344	4/1	13.0	4.1	1.5	0.0	1.2	11				
Benton Springs	Idaho		4900	4/1	82.0	32.8	22.5	16.3	18.1	11				
Boyer Mountain	Washington		5250	3/31	88.0	35.4	25.1	17.1	---	3				
Brush Creek	Montana	17	5000	3/29	59.0	19.0	---	---	8.6	4				
Bunchgrass Mdw.	Washington		5000	3/30	93.0	34.0	25.5	29.1	27.5	8				
Freezeout Summit	Montana	6	7000	3/30	112.4	37.6	33.7	39.8	28.9	12				
Hoodoo Creek	"	7	6200	3/30	144.6	59.5	42.7	57.2	42.5	12				
Lookout	Idaho		5250	4/1	119.0	48.7	37.5	36.8	29.4	11				
Mosquito Ridge	"		5110	3/31	115.0	44.5	31.5	33.3	32.1	11				
Nelson	Canada		3050	3/30	57.0	18.8	15.0	13.3	11.7	10				
Smith Creek	Idaho		4800	4/1	124.0	49.3	42.2	51.4	38.1	9				
Average for Drainage					94.9	36.6	28.9	31.4	24.9					

**Location of course shown on Index Map.

SOIL CONSERVATION SERVICE
Bozeman, Montana

JANUARY 1, 1949 SNOW SURVEY DATA

SNOW COURSE	BASIN	DATE SURVEY	1949		DENSITY	COMPARABLE DATE 1948		
			SNOW DEPTH	WATER EQUIV.		Snow Depth	Water Equiv.	Density
Trout Lake	Flathead River	12/21/48	52.8	13.3	25.8	----	----	----
Lookout	Clark Fork	12/31/49	82.0	24.2	30.8	----	----	----
Marias Pass	Marias-Flathead	1/4/49	35.7	9.9	27.8	24.5	4.8	19.6
Rimini, Lower	Tenmile-Missouri	1/3/49	21.0	4.2	20.0	24.6	5.3	21.5
Rimini, Middle	Tenmile-Missouri	1/4/49	27.5	6.3	22.5	31.0	7.5	24.1
Rimini, Upper	Tenmile-Missouri	1/4/49	30.4	7.7	25.3	35.6	9.4	25.8
Chessman Res.	Tenmile-Missouri	1/2/49	14.1	3.1	21.9	17.8	5.0	28.1
West Yellowstone	Madison	1/4/49	33.2	7.8	23.6	18.5	3.7	20.0
Hebgen Dam	Madison	1/4/49	36.4	8.5	23.3	26.9	6.8	25.2
Twenty-One Mile Lake	Gallatin	1/4/49	46.0	12.7	27.6	24.5	5.4	22.1
Canyon	Yellowstone	1/1/49	30.5	7.4	24.3	----	----	----
Lupine	Yellowstone	1/1/49	37.8	7.7	20.4	22.8	5.4	23.7
Mystic Lake	Gardiner	12/30/48	30.9	6.4	20.7	20.4	3.6	17.4
New World	Gallatin	1/6/49	23.6	5.5	22.5	25.9	5.6	21.5
North Entrance (Cook City)	Gallatin	1/6/49	26.0	6.6	23.1	----	----	----
	Yellowstone	12/31/48	24.5	6.2	25.3	18.6	3.6	19.4

APPENDIX

Location of snow survey courses in adjacent basins and not shown on INDEX MAP but shown in tabulated data.

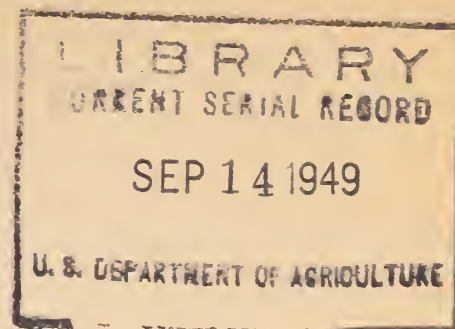
Course	State	No.	Elev.	Location			Basin
				Sec.	Twp.	Range	
				or Latitude and Longitude			
JEFFERSON RIVER							
Camp Creek	Idaho		6800	21	13N	36E	Snake River
MADISON RIVER							
Valley View	Idaho		6500	7	15N	44E	Snake River
Big Springs	Idaho		6500	34	14N	44E	Snake River
YELLOWSTONE RIVER							
Canyon	Wyoming	2	7750	44-54		110-37	Yellowstone Park
Lake	Wyoming	1	7850	44-44		110-30	Yellowstone Park
Lupine Creek	Wyoming	3	7300	44-54		110-37	Yellowstone Park
Sylvan Pass	Wyoming	32	7100	12	52N	110W	Shoshone River
KOOTENAI RIVER							
Ferguson	Canada		3000	50-40		117-30	Upper Kootenai
Fernie	Canada		3500	49-31		115-01	Upper Kootenai
Gray Creek	Canada		5100	49-37		116-41	West Kootenai
Kimberly	Canada		3750	49-41		115-59	East Kootenai
Lardeau	Canada		6000	50-36		117-16	Upper Kootenai
Marble Canyon	Canada		5000	51-12		116-09	East Kootenai
Nelson	Canada		3050	49-25		117-14	West Kootenai
Sandon	Canada		3500	49-59		117-13	Upper Kootenai
Sinclair Pass	Canada		4500	50-40		115-58	East Kootenai
Smith Creek	Idaho		4800	29	64N	3W	Kootenai
Sullivan Mine	Canada		5100	49-43		116-01	East Kootenai
Upper Elk River	Canada		4400	50-01		114-56	East Kootenai
BITTERROOT RIVER							
Nezperce Pass	Idaho		6575	32	28N	16E	Clearwater
Packers Mdw.	Idaho		5700	15	38N	15E	Clearwater
PEND OREILLE RIVER							
Benton Mdw.	Idaho		2344	27	28N	4W	Priest River
Benton Springs	Idaho		4900	30	28N	3W	Priest River
Boyer Mountain	Washington		5250	7	31N	43E	Lower Clark Fork
Bunchgrass Mdw.	Washington		5000	24	37N	44E	Lower Clark Fork
Lookout	Idaho		5250	4	47N	6E	Clark Fork
Mosquito Ridge	Idaho		5110	5	54N	2E	Clark Fork
Nelson	Canada		3050	49-25		117-14	West Kootenai
Smith Creek	Idaho		4800	29	64N	3W	Kootenai
SHIELDS RIVER							
Porcupine	Montana		6500	10	4N	10E	Missouri
BOULDER RIVER							
Independence	Montana		8000	22	7S	12E	Missouri
UPPER CLARK FORK							
Limestone Pass	Montana		7000	4	17N	15W	Columbia
Medicine Creek	Idaho		6200	24	43N	10E	St. Joe
Trout Lake	Montana		3700	22	20N	17W	Flathead





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FEDERAL-STATE
COOPERATIVE SNOW SURVEYS and
IRRIGATION WATER FORECASTS



FOR

MONTANA

APRIL 15, 1949

by
Montana Agricultural Experiment Station
and
Division of Irrigation, Soil Conservation Service
United States Department of Agriculture

in cooperation with

U.S. Forest Service....U.S. National Park Service....U.S. Bureau
of Reclamation....U.S. Geological Survey and State
Engineer of Montana

APRIL 15 SUMMARY
OF IRRIGATION WATER SUPPLY FOR MONTANA

Due to large accumulation of snow in the mountains as indicated in earlier reports of snow surveys, which equalled and in many places exceeded comparable dates in 1948, it was decided to make supplemental surveys on April 15, May 1, May 15 and possibly June 1, depending upon snow conditions subsequent to these dates. The following tabulation of data collected from our various cooperators for April 15, is presented for your information.

Without comparable data for April 15 of past years, forecast revisions were not attempted at this time. A comparison of per cent density of the snow pack has been displayed. It is evident that although there is an apparent loss of water content from April 1 to April 15, the present water content is higher than 1948 and the density of the snow is higher than 1948 as of April 1. The density of a snow pack always increases as the season progresses. This is a ripening process and the snow usually attains a density of about 45 to 50 per cent before melting becomes evident. The relatively high density of the present snow pack could well be an indication that runoff is ready to begin.

The snow melt season during April has been ideal with cold nights, warm days and a few storms that have brought a little precipitation to consolidate the snow pack. The absence of the usual January thaw or chinook in midwinter brought about an unpacked condition of the snow that lasted up into April. The high density of the pack, however, indicated that the snow was not all "Fluff." Without the midwinter thaw continued cold weather drove frost into the ground to considerable depths. The frost action heaved the soil, making it very porous and susceptible to receiving moisture. This perhaps explains the lack of a sudden rise in stream flow during the period when the large volume of snow was melting from the plains area during late March and more than likely is the reason for the lack of early runoff during the first weeks of April. These facts are brought out by ground water measurements made by the U.S. Geological Survey. These measurements indicate that in many basins the ground water has risen from two to five feet during the winter and early spring months. This ground water will tend to bolster up the late summer flow.

All data collected indicates an "EXCELLENT" supply of water for irrigation use this season. At the same time the possibility of extremely high peak flow still exists. In most basins there is more water in the snow this year than last year. The density is higher than last year which makes possible an early runoff season.

Reservoir storage is good for this time of year. The Montana Power Company Reservoirs are being lowered at present to make room for the above normal spring flow to follow shortly. This will materially help to provide some room for "Flood Control" operations.

Reservoirs that are as high or higher than last year at this date, and which do not have adequate spillway capacity, should be drawn down to a safe margin and plans should be made for per cent above normal flow as indicated in the April first bulletin.

MONTANA SNOW SURVEYS April 15, 1949

COLUMBIA BASIN		SNOW MEASUREMENTS											
DRAINAGE BASIN		State	No.	Elev.	Date of Survey 1949	Snow Depth (In.) 1949	Water Content (Inches)				Density		
AND							April 15	Per cent	April 1, 1949	W.C.		Density	April 1, 1948
SNOW COURSE **							1949	Density	W.C.	Density		W.C.	Density
Kootenai River		Montana	1	6000	4/15	113.9	51.0	44.8	55.2	42.1	40.6	36.0	
Baree Mt.		"	24	6800	4/14	95.2	37.7	39.6	38.2	34.8	36.8	36.4	
Bluebird Basin													
Upper Clark Fork		Montana	11	7780	4/15	46.4	15.6	33.6	16.0	30.2	19.7	30.7	
Storm Lake		"	8	7100	4/18	41.0	14.0	34.2	18.8	34.2	19.2	29.1	
Slide Rock Mt.		"	16	6900	4/15	37.0	11.1	30.0	13.5	21.0	10.3	23.4	
Stemple Pass		"	13	7400	4/18	52.9	22.2	42.2	23.4	35.2	37.5	40.3	
Stuart Mt. #1		"	7	7258	4/18	59.3	26.2	44.2	34.6	41.7	29.2	34.0	
Skalkaho Summit													
Bitterroot													
Packers Mdw.		Idaho		5700	4/18	54.3	29.9	55.3	34.4	40.3	24.3	36.4	
Stuart Mt. #1		Montana	13	7400	4/18	52.9	22.2	42.2	23.4	35.2	37.5	40.3	
Flathead													
Desert Mt.		Montana	3	5600	4/14	44.7	17.0	38.0	19.0	32.8	14.7	27.8	
Hell Roaring Cr. Liv.		"	6	5770	4/14	79.2	34.1	43.1	33.0	36.0	28.6	33.8	
Benton Mdw.		Idaho		2344	4/12	65.0	29.4	44.3	32.8	40.0	22.5	37.0	
Benton Springs		"		4900	4/11	1.0	0.0	----	4.1	31.6	1.5	25.0	
Baree Mt.		Montana	1	6000	4/15	113.9	51.0	44.8	55.2	42.1	40.6	36.0	
Freezeout		"	6	7000	4/13	92.1	39.6	43.0	37.6	33.6	33.9	30.6	
Lookout		Idaho		5250	4/15	96.0	45.0	46.8	48.7	41.7	37.5	35.8	
Nezperce Camp		Montana	4	5580	4/14	39.0	14.2	36.5	20.8	36.6	14.9	32.4	
Nezperce Pass		Idaho		6575	4/14	47.0	19.1	40.6	23.8	34.6	23.6	35.2	

MONTANA SNOW SURVEYS April 15, 1949

MISSOURI BASIN					SNOW MEASUREMENTS										
DRAINAGE BASIN AND					Water Content (Inches)										
SNOW COURSE **					April 15 1949	Per cent Density	April 1, 1949 W. C. Density	April 1, 1948 W.C. Density							
Jefferson River															
Jahnke Creek					24	7340	4/14	35.6	12.2	34.4	14.4	31.6	9.1	25.3	
Goldstone					22	8100	4/14	50.6	18.7	37.0	19.0	32.0	12.7	27.3	
Terrell Creek					20	6650	4/14	9.8	4.0	40.8	6.0	23.5	3.5	23.2	
Selway Junction					21	6800	4/14	27.4	9.2	33.7	12.0	30.5	6.8	23.9	
Elk Horn					11	8450	4/15	32.6	11.1	34.1	13.6	32.5	9.4	24.6	
Madison River															
Twenty-One Mile					6	7150	4/14	44.8	17.0	38.0	20.5	36.5	14.4	26.0	
Gallatin River															
Twenty-One Mile					6	7150	4/14	44.8	17.0	38.0	20.5	36.5	14.4	26.0	
Missouri Main Stem															
Kings Hill					25	7950	4/15	49.3	16.0	32.6	16.9	32.3	13.1	28.0	
Stemple Pass					16	6900	4/15	37.0	11.1	30.0	13.5	21.0	10.3	23.4	
Marias River															
Marias Pass					21	5250	4/15	45.6	17.6	38.6	21.4	34.1	18.9	27.6	
Yellowstone River															
Canyon #2					2	7750	4/20	40.3	12.3	30.6	14.9	31.4	10.2	22.7	
Lake					1	7850	4/20	33.8	11.7	34.7	15.2	32.2	11.5	25.9	
Cook City					10	7400	4/20	28.7	8.8	30.6	10.6	27.3	10.1	26.6	

